

We Claim:

1. A bistable structure comprising:

a deflection element including mechanically constrained end points and a compliant span between the end points that is substantially free to deflect between two stable positions when a force is applied at a point along the span;

wherein the deflection element span is provided, as-fabricated, curved in one of the two stable positions and in a mechanically unstressed condition along span length;

wherein the as-fabricated curve of the deflection element span includes a curve maxima at a point along span length that is at least about $\frac{1}{4}$ of the span length from the end points of the span; and

wherein the deflection element span is constrained to substantially prohibit development of a second bending mode that is characteristic for the span as the element deflects between the two stable positions.

2. The bistable structure of claim 1 wherein the deflection element comprises a beam.

3. The bistable structure of claim 1 wherein the deflection element comprises two beams connected together at a point along the spans of the beams by an interconnecting clamp that prohibits development of a second bending mode that is characteristic for the spans as the element deflects between the two stable positions.

4. The bistable structure of claim 1 wherein the deflection element comprises a plate.

5. The bistable structure of claim 1 wherein the deflection element comprises a diaphragm.

1 6. The bistable structure of claim 1 wherein the constrained end points of the
2 span are clamped.

1 7. The bistable structure of claim 1 wherein the constrained end points of the
2 span are hinged.

1 8. The bistable structure of claim 1 wherein the constrained end points of the
2 span comprises torsional spring elements.

1 9. The bistable structure of claim 1 wherein the span comprises aluminum.

1 10. The bistable structure of claim 1 wherein the span comprises silicon.

1 11. The bistable structure of claim 9 wherein the curve of the deflection element
2 span corresponds to a lithographic mask defining the curve as-fabricated.

1 12. The bistable structure of claim 11 wherein the lithographic mask defines an
2 etch mask pattern for etching the curve of the deflection element span.

1 13. The bistable structure of claim 1 wherein the curve of the deflection element
2 span comprises a trajectory along the span length corresponding to a first bending mode
3 characteristic for the span.

1 14. The bistable structure of claim 1 wherein the curve of the deflection element
2 span comprises a trajectory along the span length defined as $\frac{\bar{d}(1 - \cos(2\pi x/l))}{2}$, where \bar{d} is
3 the curve maxima value and x is the distance along the span length between 0 and l .

1 15. The bistable structure of claim 1 wherein the maxima of the curve of the
2 deflection element span is located at substantially the center of the span.

1 16. The bistable structure of claim 1 further comprising a plurality of electrically
2 conductive relay contacts disposed at positions that are separated from the deflection element
3 by a separation distance selected such that an electrical connection is provided between the
4 relay contacts when the deflection element is in one of the two stable positions.

1 17. The bistable structure of claim 16 wherein the electrical connection provided
2 between the relay contacts comprises mechanical contact of each relay contact with an
3 electrically conducting cross bar that is compliantly connected to the deflection element.

1 18. The bistable structure of claim 1 further comprising a force generation
2 actuator including a mechanical force applicator that is disposed relative to the deflection
3 element to apply a force to the deflection element span and that is connected to receive an
4 electrical stimulus for applying the force.

1 19. The bistable structure of claim 18 wherein the electrical stimulus comprises an
2 electrostatic actuation voltage.

1 20. The bistable structure of claim 18 wherein the electrical stimulus comprises a
2 thermal actuation voltage.